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November 18, 2016

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Written *ex parte* presentation in RM-11681

Dear Ms. Dortch:

Attached is correspondence submitted today to NOAA and NTIA that is relevant to the proposed rulemaking to reallocate 1675-1680 MHz to shared commercial use.

Please direct any questions to the undersigned.

Sincerely,

/s/Gerard J. Waldron
Gerard J. Waldron
Counsel to Ligado Networks LLC

Attachment

cc: Jessica Almond
Ed ("Smitty") Smith
Johanna Thomas
Erin McGrath
Brendan Carr
Daudeline Meme
Charles Mathias
Paul Murray
Ron Repasi
Jennifer Tatel
Bob Nelson

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November 18, 2016

Dr. Kathryn Sullivan
Administrator
National Oceanic and Atmospheric Administration
1401 Constitution Avenue NW, Room 5128
Washington, DC 20230

Lawrence E. Strickling
Administrator
National Telecommunications & Information Administration
U.S. Department of Commerce
1401 Constitution Ave., N.W.
Washington, D.C. 20230

Re: NOAA Spectrum at 1675 to 1680 MHz

Dear Dr. Sullivan and Mr. Strickling:

There continues to be misunderstanding among some in the weather enterprise about the impact of fulfilling President Obama's policy to share radio spectrum at 1675-1680 MHz between NOAA and commercial users. The attached presentation explains in graphic detail why parties with weather sensors reporting water levels, currents, and other weather conditions do not use the spectrum President Obama has repeatedly indicated should be auctioned for shared terrestrial use. As a matter of physics, there is absolutely no reason to worry about any of these devices experiencing any sort of impact from a base station or handset using the subject frequency.

The presentation further explains how, at all times, it has been clear that a very small number of large earth stations are or will be the only receivers of signals from GOES or GOES-R satellites. With regard to those stations that are government-owned—of which there are only a couple of dozen—Ligado has repeatedly urged that the Federal Communications Commission require that the licensee awarded the terrestrial license be required to create protection zones around those government-owned earth stations to effectively eliminate any possible interference. No party within NOAA has ever asserted that these protection zones are anything other than entirely satisfactory.

It has also been contended that certain other firms buy earth stations—which cost

upwards of $100,000 or more—to receive the signals from the government-owned satellites. One example of these non-governmental users is a commercial enterprise with the means to pay for the expensive dish that receives the signal and manage the complex data. As far as Ligado or any other party can determine, there are fewer than 100 such entities.

An important question related to these users is whether a wholly satisfactory solution would be to require the licensee of the spectrum or NOAA to provide them with an alternative form of equally reliable, equally timely access to the very same weather data. This alternative form of access could be, specifically, a content delivery network that provides high-speed connections to data (such as the one used by the Financial Industry Regulatory Authority) at no cost to the affected users. This question could be included in a Notice of Proposed Rulemaking issued by the FCC so that the next Administration can make an informed decision regarding the terrestrial use of the subject spectrum.

Finally, Ligado's proposed approach for the subject spectrum implements the approach for the 1675-1695 MHz band laid out in the Commerce Department's *Quantitative Assessments of Spectrum Usage* report.[1] The report notes that opportunities may exist to accommodate wireless broadband in the 1675-1695 MHz band as long as a feasibility study is completed and the impact to non-federal users is taken into account.[2] In fact, Ligado has already undertaken a feasibility study—which is why it has offered the creation of protection zones around the government-owned earth stations, and its proposal for the content delivery network addresses the impact to non-federal users.

Thank you for your consideration of this important information. Please direct any questions to the undersigned.

Sincerely,

/s/Gerard J. Waldron
Gerard J. Waldron
Counsel to Ligado Networks LLC

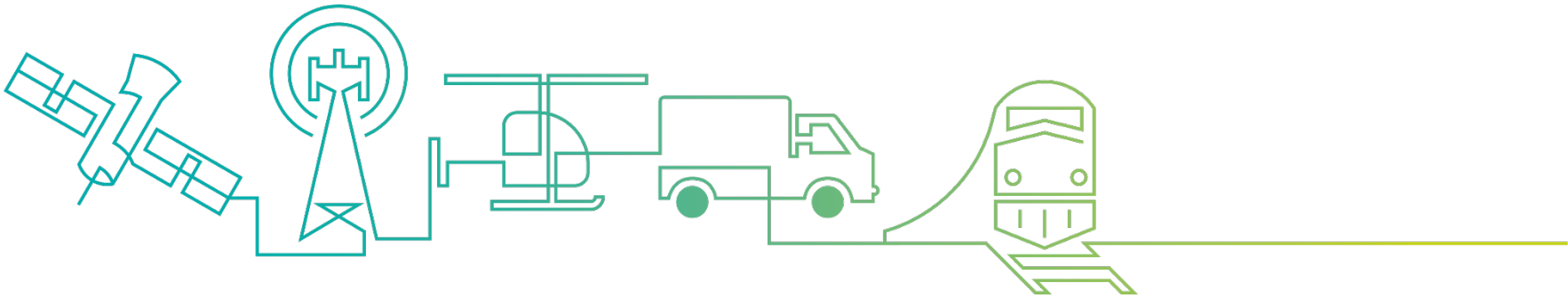
cc: Ms. Penny Pritzker, United States Secretary of Commerce

Attachment

[1] *See* U.S. Dep't of Commerce, *Quantitative Assessments of Spectrum Usage* (Nov. 2016).
[2] *See id.* at 8.

Data Collection System

NOVEMBER 18, 2016



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Current & Future Terrestrial Data Collection by NOAA

- How is weather data gathered and disseminated? NOAA needs to end the widespread misunderstanding that plagues the weather community

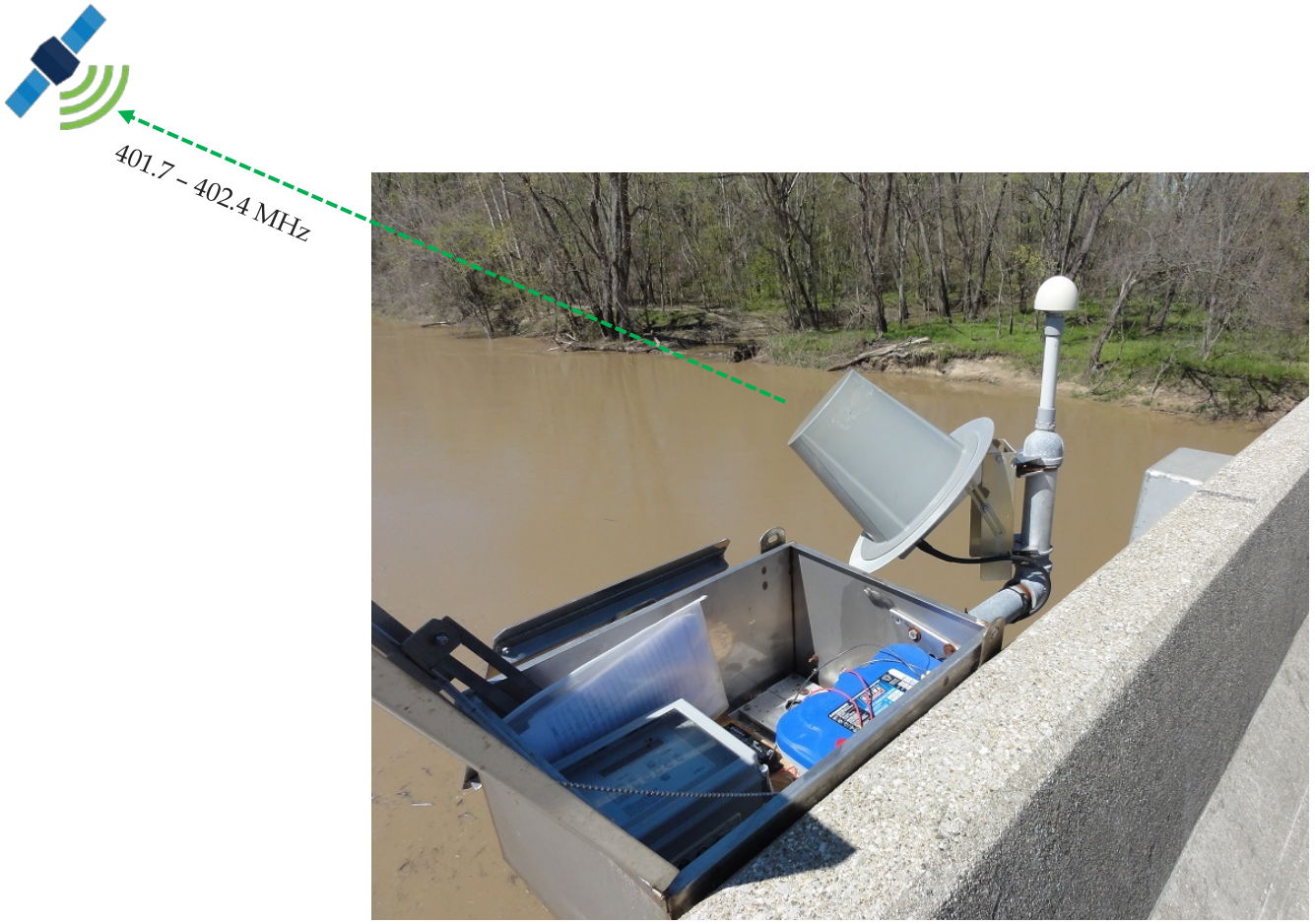
- Many entities can purchase sensors that measure water levels, water directions, and currents. Approximately 20,000 may be in existence. None of them send or receive signals in the 1675-80 MHz band that the President wants shared for terrestrial use. Instead, these Data Collection Platform (DCP) sensors send signals up to GOES satellite (Earth-to-space) in the 401.7 – 402.4 MHz band. These signals are going to be sent to the GOES-R satellites in the future as early as 2017.

- The GOES satellite constellation sends the data received from DCP sensors down to less than two dozen large earth stations operated by NOAA, a couple other government agencies, and fewer than one hundred non-NOAA users at the 1694 MHz frequency; in the near future this information will be sent instead from the new GOES-R satellites on the 1679.7 MHz frequency.

- The sensors mostly transmit but do not receive. Few DCP sensors can accept commands, however these commands are received by capable devices over the 400 MHz spectrum

Example of Water Level DCP Sensor Sending Data Signals Up

GOES Satellite



Example of water level sensor and DCP radio system operating at 401.7 – 402.4 MHz

Photo from NWS Co-op observer program website : https://www.weather.gov/ilx/coop-equipment

Example of Federal NOAA Earth Station Receiving DCP Data Signals Down

GOES Satellite

1694 MHz Currently [1679.7 MHz for GOES-R in Future]

Example of NOAA earth station at Wallops, Virginia. This antenna is 16.4 meters (53.8 feet) in diameter is one of a pair of dishes allocated to receiving GOES satellite data including that from DCP sensors. From the earth station, the DCP data enters a complex NOAA data network for DCS.

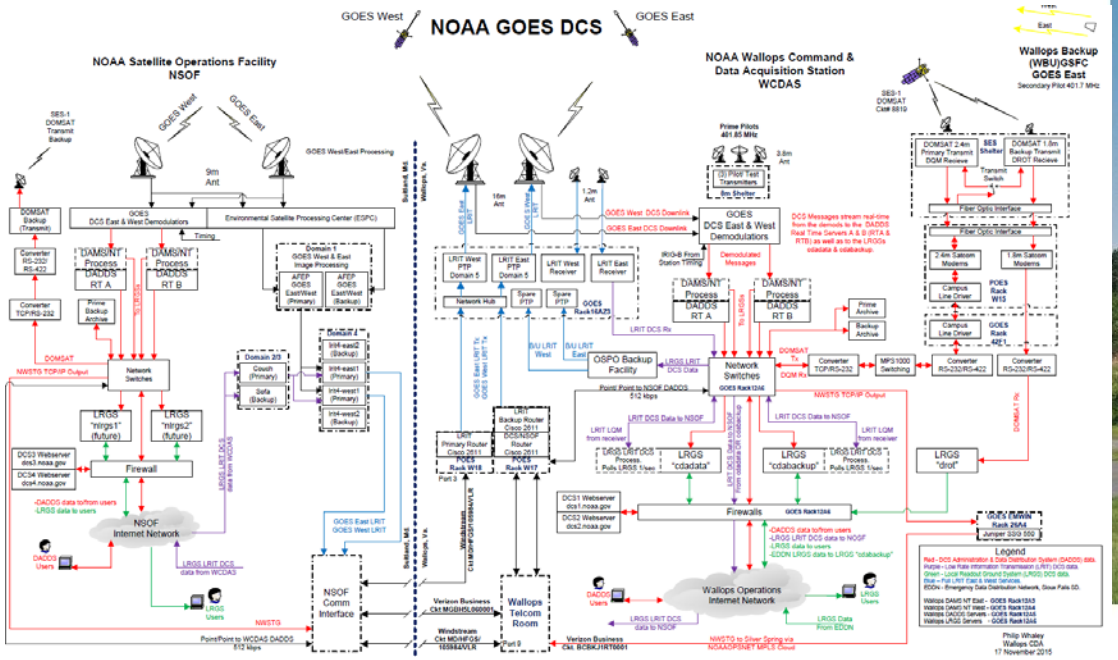
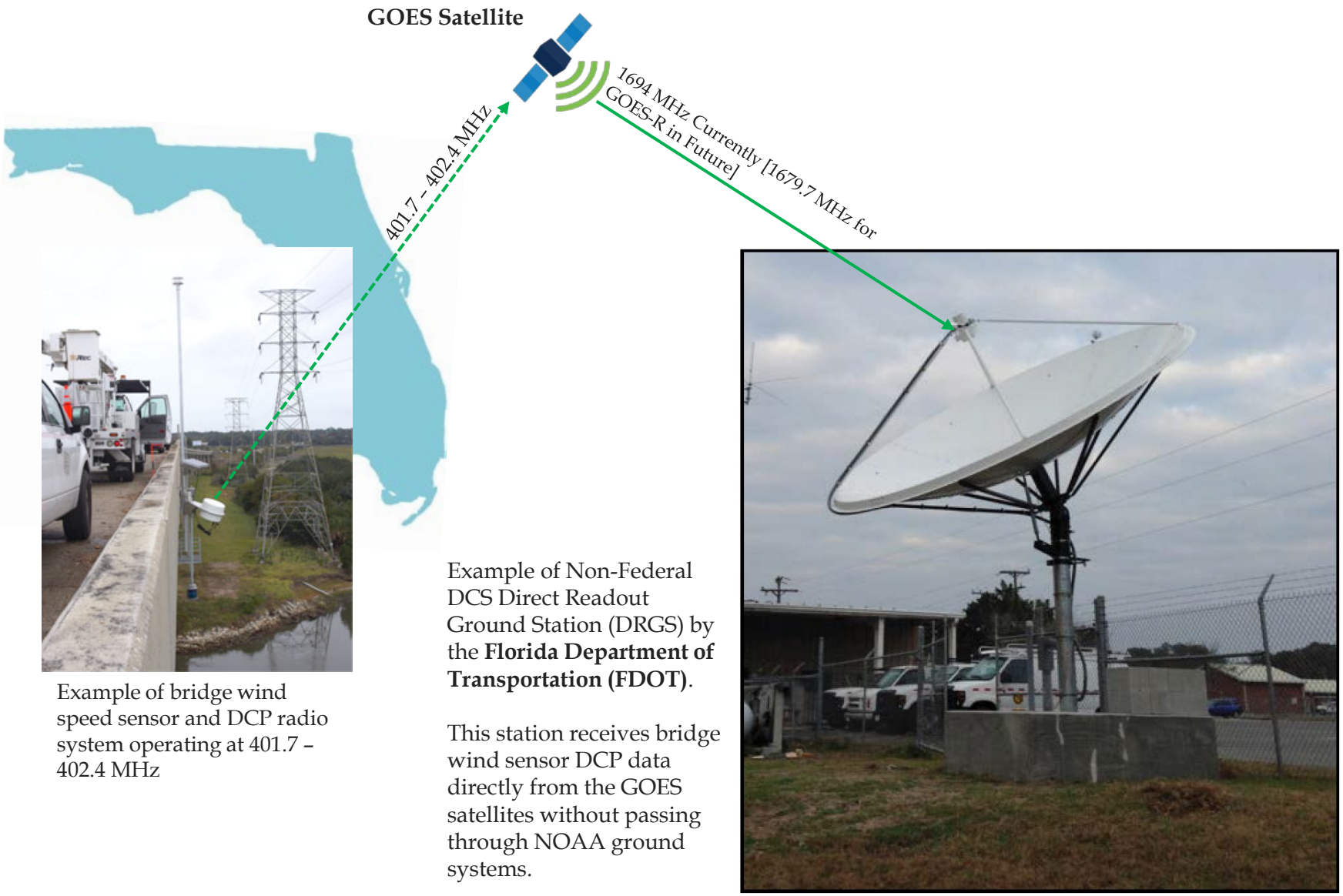


Figure 2-15. Wallops 16.4 Meter (HR-1) Antenna

Example of Non-federal Earth Station Receiving DCP Data Signals Down



Example of bridge wind speed sensor and DCP radio system operating at 401.7 – 402.4 MHz

Example of Non-Federal DCS Direct Readout Ground Station (DRGS) by the **Florida Department of Transportation (FDOT)**.

This station receives bridge wind sensor DCP data directly from the GOES satellites without passing through NOAA ground systems.

Basics of Data Collection System (DCS) – Data Collection Platforms

GOES-West

DCPs have many monitoring uses with two water based examples depicted here. All sensors share the earth to space uplink spectrum at 400 MHz for their data and that data is frequency upshifted to 1694 MHz currently (1679.7 MHz future) and relayed to a small number of large, costly ground stations.

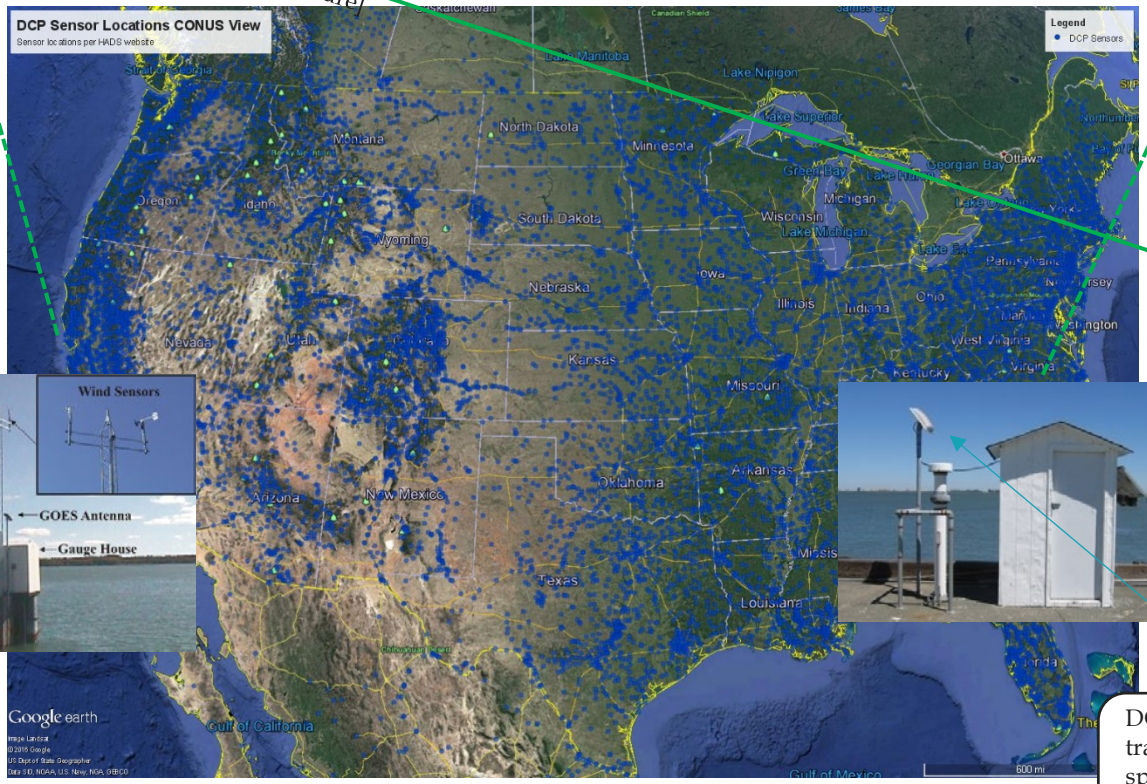
GOES-East

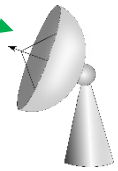
1694 MHz Currently [1679.7 MHz for GOES-R in Future]

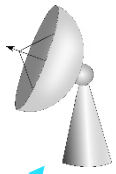
401.7 – 402.4 MHz

401.7 – 402.4 MHz

1694 MHz Currently [1679.7 MHz for GOES-R in Future]





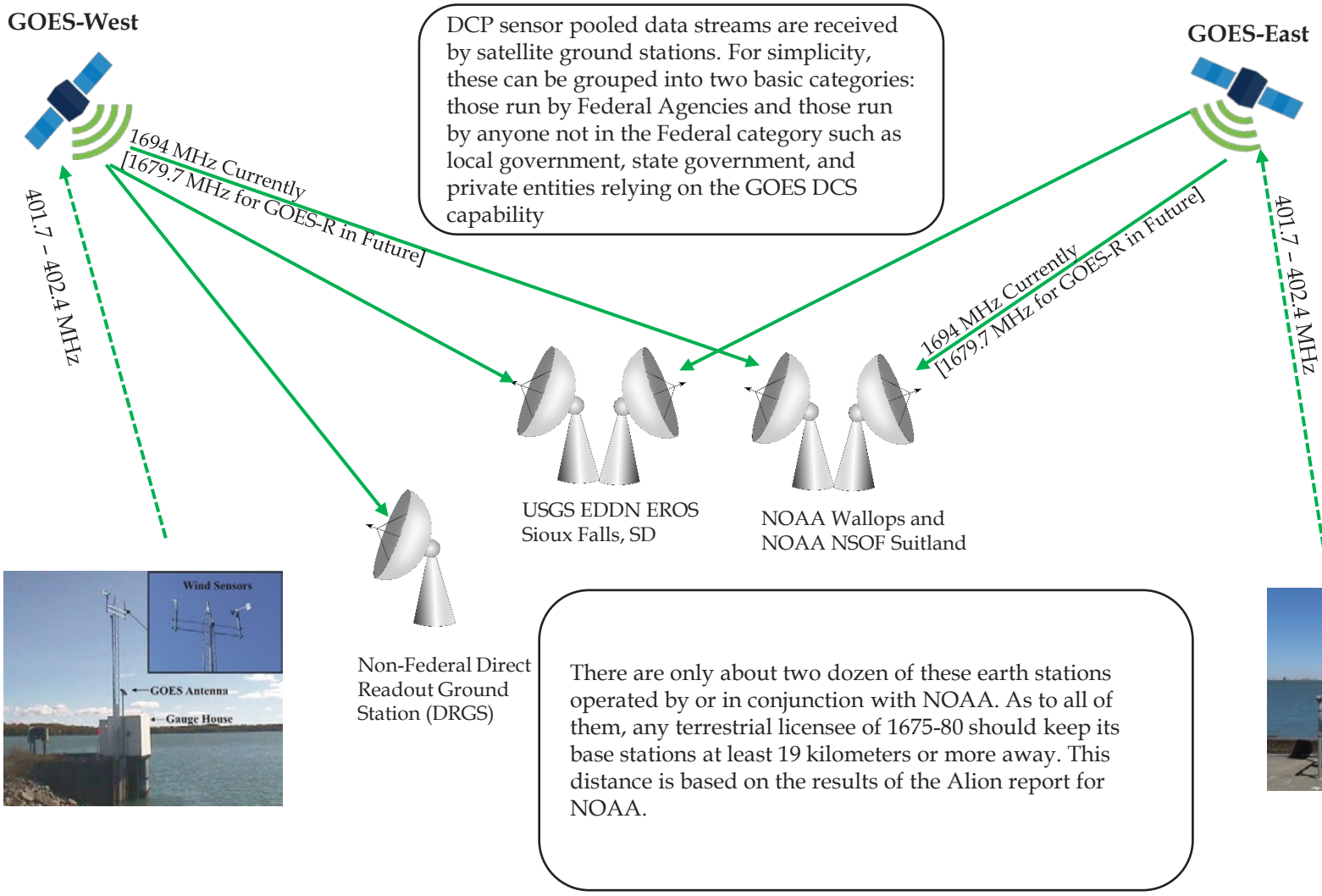


DCP sensor pooled data streams received by satellite ground stations. To have access to all DCP data you need receive GOES East and West relays at 1694 MHz currently (1679.7 MHz future)

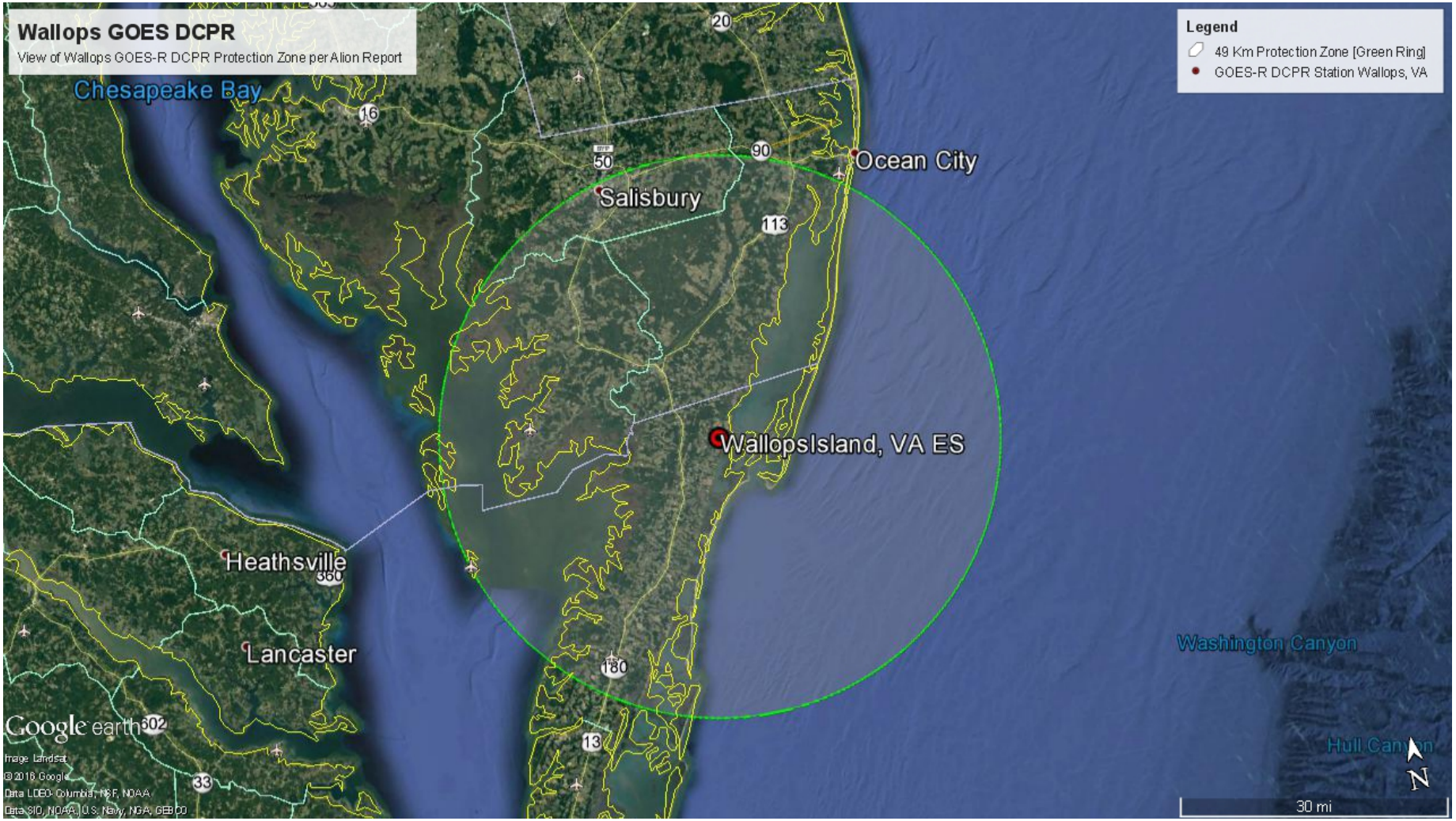
DCPs use small transmitters that rely on spectrum at 402 MHz to carry sensor data to GOES satellites

Terrestrial Data Collection Platform (DCP) Sensors depicted as Blue Dots – This represents only a portion **of 27,000+** sensor in current operation

Basics of Data Collection System (DCS) – Satellite Ground Stations

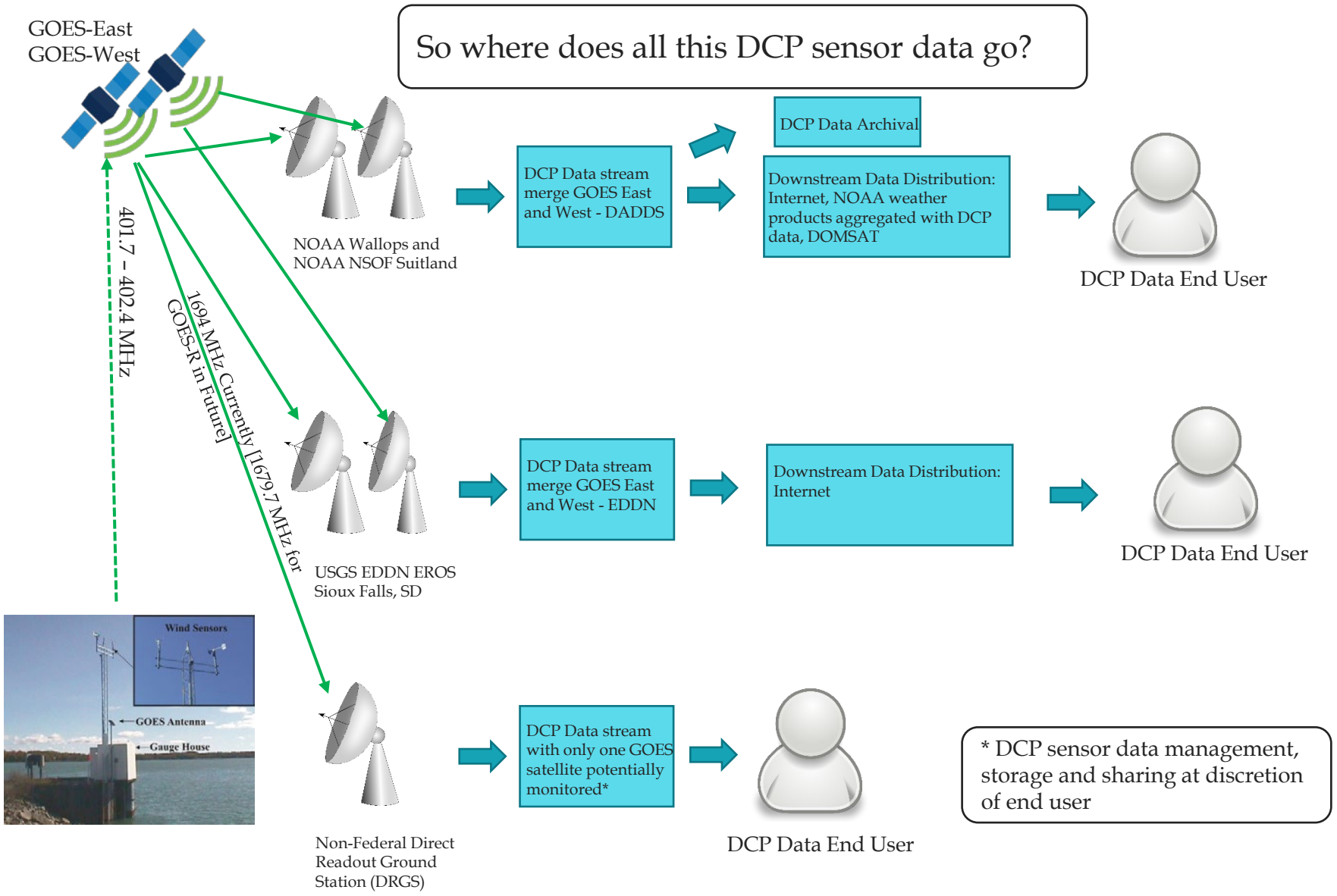


Protection Zone Around Wallops Island for GOES-R DCS Satellite Reception



Protection Zones for GOES-R DCS Satellite Reception in CONUS

Basics of Data Collection System (DCS) – Sensor Data Distribution



appendix

Federal DCPR Earth Stations on Future NOAA GOES-R Satellite

There are 15 DCPR earth stations in the CONUS belonging to following federal agencies:

- NOAA
- DoD
- DOI
- USGS
- TVA

Protection zones for 17 DCPR (DRGS) stations per the Alion report

Location	GOES-R Data Link	Protection Distance, km
Boise, ID	DCPR-1 (DRGS)	39
Cincinnati, OH	DCPR-1 (DRGS)	40
College Park, MD	DCPR-1 (DRGS)	38
Columbus, MS	DCPR-1 (DRGS)	34
Fairmont, WV	DCPR-1	66
Ford Island/Pearl Harbor, HI	DCPR-1 (DRGS)	19
Kansas City, MO	DCPR-1 (DRGS)	53
Norman, OK	DCPR-1 (DRGS)	41
Omaha, NE	DCPR-1 (DRGS)	24
Rock Island, IL	DCPR-1 (DRGS)	21
Sacramento, CA	DCPR-1 (DRGS)	92
San Juan, PR	DCPR-1 (DRGS)	36
Sioux Falls, SD	DCPR-1 (DRGS)	46
St Louis, MO	DCPR-1 (DRGS)	70
Stennis Space Center, MS	DCPR-1 (DRGS)	52
Vicksburg, MS	DCPR-1 (DRGS)	37
Wallops, VA	DCPR-1	49